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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/580,491	05/23/2006	Horst Vestweber	14113-00012-US	2381
23416 7590 12/21/2009 CONNOLLY BOVE LODGE & HUTZ, LLP P O BOX 2207 WILMINGTON, DE 19899			EXAMINER CLARK, GREGORY D	
			ART UNIT 1794	PAPER NUMBER
			MAIL DATE 12/21/2009	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/580,491	<b>Applicant(s)</b> VESTWEBER ET AL.	
	<b>Examiner</b> GREGORY CLARK	<b>Art Unit</b> 1794	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 23 October 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 27 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-26 and 28-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### DETAILED ACTION

The examiner acknowledges the receipt of the applicants' arguments dated 09/24/2009.

Claims 1-30 pending.

### ***Claim Rejections - 35 USC § 102***

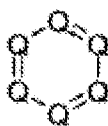
The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. **Claims 1-4, 4-6 and 15-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Oshiyama (US 2003/0198831).**
2. **Regarding Claim 1**, Oshiyama discloses an organic electroluminescent device (OLED) that contains a light emission layer (emission layer), a hole blocking layer, an anode and a cathode (paragraph 59). The light emission layer contains a host material (matrix material) and a phosphorescent compound (dopant) (abstract). The hole blocking layer can be made of materials that include pyrimidine derivatives or triazine derivatives (paragraph 70).

The applicant claims the compound represented by Formula 1 shown below:



(Formula 1)

Where Q is N or CR and Q is at least two and a maximum of four nitrogen atoms and R can be an aromatic group. The applicant further claims a compound with  $NR^1$  where  $R^1$  can be a hydrogen atom.

The pyrimidine derivatives and triazine derivatives disclosed by Oshiyama reads on Formula 1 claimed by the applicant:

Pyrimidine derivatives Q is 2

Triazine derivatives Q is 3

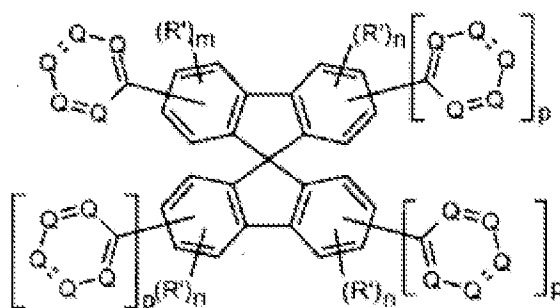
3. **Regarding Claim 2**, Oshiyama discloses that the device contains an electron transporting layer (abstract).
4. **Regarding Claims 4-6**, Oshiyama discloses that pyrimidine derivatives or triazine derivatives can be used for the hole-blocking layer (abstract) (per claims 4 and 5). The examiner takes the position that triazine derivatives would be inclusive of 1,2,4-triazines and 1,3,5-triazines (per claim 6).
5. **Regarding Claim 15**, Oshiyama discloses an OLED where a carbazole derivative is used as the host material (matrix material) (paragraph 8).

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6. **Regarding Claims 16-17**, Oshiyama discloses that the phosphorescent dopant materials can be an iridium complex (contains Ir atomic number 77, per claims 16-17) (paragraph 16).

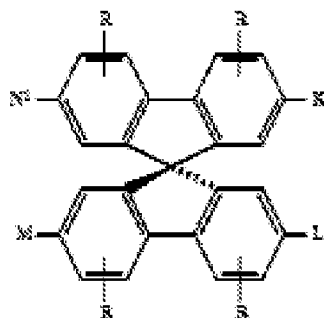
7. **Claims 22-26 and 28-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Lupo (US 5,840,217).**

8. **Regarding Claim 22**, The applicant claims the compound represent by Formula 2 (shown below):



Formula 4

Lupo discloses formula L-1

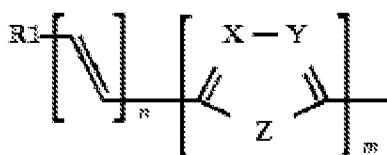


where the symbols and indices have the following meanings:

$R$ ,  $L$ ,  $M$ ,  $N$  are identical or different and are

L-1

Where M-N-L-K can be represented by formula L-1c (column 2)



and  $R = H$ ,  $n = 0$ ,  $m = 1$ ,  $X = N$ ,  $Y = N$ ,  $Z$  is  $CH=N-$ , formula L-1c is a 1,2,4-triazine (per claims 22- 23) that reads on the applicant formula 2 when  $p = 1$  and  $R' = H$ .

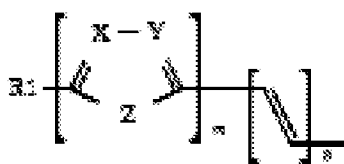
Formula L-1 shows that  $R$  can be identical or different; when  $m = 0$  in applicants' formula 2, one of the  $R$  positions in Lupo's L-1 is  $H$  (per claim 24) (column 2 lines 16-31).

9. **Regarding Claim 25**, Lupo's formula L-1 (above) show that two triazine units can be bonded to the same fluorene sub-unit of the spirobifluorene.

10. **Regarding Claim 26 and 28**, Lupo's formula L-I/L-Ic where m and n can be 1-3 (polymer) (column 3, line 27) (per claim 26). Lupo also discloses that the spiro compound can be used in an OLED (abstract) (per claim 28).

11. **Regarding Claim 29**, Lupo discloses that the spiro compound can be used in an OLED in a light emitting diode (column 1, line 20).

12. **Regarding Claim 30**, Lupo shows formula L-1a (below) contains the Z group that links the spirobifluorene unit to the heterocyclic group. The Z group in formula L-1a is the C=C (2 carbons, even number).



L-1a

Formula L-1a show R1 (non-adjacent group) that can be replaced by NR2R3 (column 3, 16-33).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**13. Claims 3, 14 and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oshiyama (US 2003/0198831).**

**14. Regarding Claim 3,** Oshiyama discloses that the OLED that has a hole blocking layer (paragraph 59) but fails to mention what percentage is present. The applicant claims at least 50% of the compounds represented by Formula 1.

Oshiyama further mentions that the hole blocking layer can efficiently accumulate holes in the light emission layer and improve a recombination probability of electrons and holes, resulting in light emission with high efficiency (paragraph 7).

With the expectation of success, a person of ordinary skill in the art at the time of the invention would have adjusted the percentage of the pyrimidine derivative or triazine derivative (reads on applicants' formula 1) in the hole-blocking layer to improve the recombination probability of electrons and holes, resulting in light emission with high efficiency which would have included the claimed range, absent unexpected results.

**15. Regarding Claim 14,** Oshiyama discloses that the OLED has a hole blocking layer (abstract) but fails to mention the thickness of the hole blocking layer. The applicant claims a thickness of 1 to 50nm.

Oshiyama further mentions that the hole blocking layer can efficiently accumulate holes in the light emission layer and improve a recombination probability of electrons and holes, resulting in light emission with high efficiency (paragraph 7).



It would have been obvious to person of ordinary skill in the art at the time of the invention to have adjusted the thickness of the hole-blocking layer to optimize the emission efficiency which would have included the range claimed by the applicant, absent unexpected results.

16. **Regarding Claim 18-20**, Oshiyama discloses that the layers can be made by vacuum deposition (paragraph 64) but fails to mention sublimation and printing.

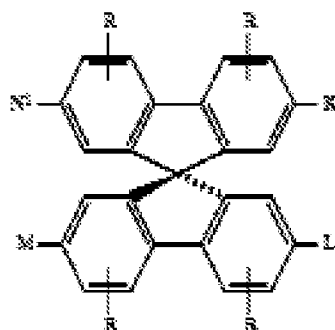
Oshiyama and Lupo teach the invention of claim1 but fail to teach each coating process claimed by the applicant. Whereas the applicant is claiming the OLED and not the process claims 18-20 are considered as product by process claims in which the process is not considered for patentability.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to have selected from known coating methods which would have included those claimed by the applicant, absent unexpected results.

17. **Claims 7-12 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oshiyama (US 2003/0198831) in view of Lupo (US 5,840,217).**

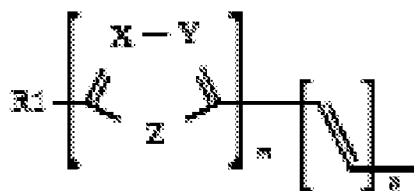
18. **Regarding Claims 7 and 11-12**, Oshiyama discloses that pyrimidine derivatives or triazine derivatives can be used for the hole-blocking layer (abstract). Oshiyama fails to mention the number of heterocyclic units present in the molecule. The applicant claims more than one unit.

Lupo discloses spiro compounds used in OLED(s) (abstract) that can contain more than one unit of applicants' formula 1. The spiro compound of Lupo is represented by formula L-1 and L-1a (Column 2):



where the symbols and indices have the following meanings:  
K, L, M, N are identical or different and are

L-1



L-1a

Where R can be H; Z can be  $-\text{CN}=\text{N}-$ ; X and Y can be N; n and m can be 0, 1, 2 or 3, R1 can be alkyl 1-22 carbons (column 3, lines 15-33).

The combination of X, Y and Z in formula L-1a can produce pyrimidine derivatives or triazine derivatives which are heterocyclic materials that read on the applicants' formula 1.

Since Oshiyama and Lupo disclose pyrimidine derivatives or triazine derivatives in an OLED and the electronic properties of such materials were also known at the time of

the invention, the pyrimidine derivatives or triazine derivatives of Oshiyama and formula L-1/L-1a of Lupo are considered as functional equivalent and readily exchangeable.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to have selected from known pyrimidine derivatives or triazine derivatives with more than one heterocyclic ring which would have included the compounds of Lupo that reads on the instant limitations, absent unexpected results.

Formula L-1 from Lupo is a 9,9' spirobifluorene compound (per claim 11 and 12).

19. **Regarding Claims 8-10**, The pyrimidine derivatives and triazine derivatives of Oshiyama used in the hole blocking layer being exchangeable with the spiro compounds of Lupo was discussed in section 18 above.

Lupo also discloses the spiro compound represented by formula L-1 and L-1a (Column 2) (above). R1 of formula L-1a can be a branched alkyl group (column 3, line 20) which is inclusive of a tert-butyl group that is non-planar (per claim 8), sp<sup>3</sup> hybridized (per claim 9) and contains a quaternary carbon (per claim 10).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to have made a series of compounds with varied R1 groups to determine the effect on solubility and coatability which would have included a tert-butyl group that reads on the applicants' limitations, absent unexpected results.

20. **Regarding Claim 21**, Oshiyama discloses an OLED but fails to mention the use as a light emitting diode.

Lupo discloses that the OLED can be used as a light emitting diode (column 1, line 20).

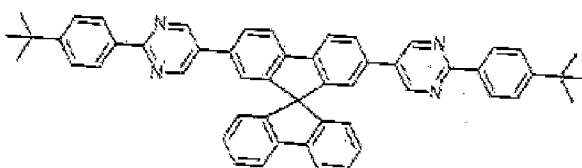
As Oshiyama and Lupo both disclose OLED(s) made from related materials, it would have been obvious to a person of ordinary skill in the art at the time of the invention to have used the OLED of Oshiyama based on the guidance of Lupo as a light emitting diode.

**21. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Oshiyama (US 2003/0198831) in view of Lupo (US 5,840,217) and further in view of Wu (Applied Physics Letters, 2002, vol. 81, no 4, p. 577-579).**

**22. Regarding Claim 13,** The pyrimidine derivatives and triazine derivatives of Oshiyama used in the hole blocking layer being exchangeable with the spiro compounds of Lupo was discussed in section 18 above.

Lupo also discloses a spirobifluorene pyrimidine derivative conjugated oligomer (m and n can be 1-3, polymeric, column 3, line 27) in an organic luminescent device (OLED). Lupo fails to mention the T<sub>g</sub> of the spiro compound L-1/L-1a.

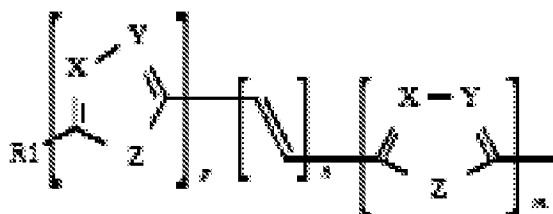
Wu shows that the T<sub>g</sub> of the spirobifluorene-based pyrimidine (W-1) is 195°C (page 577).



W-1

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Lupo further discloses that formula L-1 (above) can be substituted in the K-L-M-N position with formula L-1b (below):



Where m, n or p 0, 1, 2 or 3;

Ring 1 (left) [R1 of formula L-1a can be a branched alkyl group (column 3, line 20) which is inclusive of a tert-butyl group; x and y can be CR (R = H) and Z can be CH=CH]

Ring 2 (middle) [n=0] (removed)

Ring 3 (right) [x = N, y = CR, and Z can be CH=N-] (column 3, lines 15-33).

Given that the compounds disclosed by Lupo are higher molecular weight yet similar to those claimed by the applicant. The examiner takes the position the compounds L-1/L-1b would also have a Tg greater than 100 deg C.

***Response to Amendment***

The applicant has perfected the foreign priority; therefore, the applicants have overcome all rejections based on Wong. The examiner also acknowledges that Tominaga does not refer to spirobifluorene-all claims based on Tominaga have been withdrawn.

The examiner has applied new art (Oshiyama and Lupo) in the current office action.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GREGORY CLARK whose telephone number is (571)270-7087. The examiner can normally be reached on M-Th 7:00 AM to 5 PM Alternating Fri 7:30 AM to 4 PM and Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Larry Tarazano can be reached on (571) 272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. Lawrence Tarazano/  
Supervisory Patent Examiner, Art Unit 1794

GREGORY CLARK/GDC  
Examiner  
Art Unit 1794